

**REMARKS**

In this Response, Applicant amends claim 1, cancels claim 6, and reinstates claims 10 and 11 as previously presented in the first preliminary amendment filed on June 23, 2006. No new matter has been added. Support for the claim amendments can be found at least in previously presented claim 6.

Claims 1-5 and 7-11 are currently pending, of which claim 1 is independent. Applicant respectfully submits that all of the pending claims are in condition for allowance.

**I. The Claimed Invention**

Exemplary embodiments of the claimed invention provide a stack (12) of a polymer electrolyte fuel cell (10) which is immersed in a stack container case (14) in a liquid coolant (108) such as an organic solvent. The stack (12) whose temperature has risen by heat energy produced by the operation is cooled by the liquid coolant (108). The liquid coolant (108) which has cooled the stack (12) vaporizes, and is condensed by a condenser (16). Then, the liquid coolant (108) returns to the stack container case (14). The condenser (16) is cooled when the outside air is supplied into supply louvers (206), and contacts the condenser (16). The outside air is efficiently discharged by exhaust fans (222) through exhaust louvers (208).

**II. Rejection of Claims 1, 8 and 9 under 35 U.S.C. § 103(a)**

Claims 1, 8 and 9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over WO 2002/053402 to Poppinger (hereafter “Poppinger”) in view of JP 2002-190313 to Kususe (hereafter “Kususe”). Applicant respectfully traverses the 35 U.S.C. § 103(a) rejection of claims 1, 8 and 9 for the reasons set forth below.

**A. Claim 1**

Applicant respectfully submits that the Poppinger and Kususe references, alone or in any combination, fail to disclose or suggest at least the following feature of independent claim 1: “a plurality of protrusions protruding toward said stack are provided on an inner surface of said stack container case such that front ends of said plurality of protrusions surround said stack, and said protrusions are exposed from a surface of the liquid coolant.”

The plurality of protrusions, currently recited in claim 1, were previously presented in claim 6. In the Office Action, the Examiner does not cite the Poppinger reference or the Kususe references as disclosing or suggesting the plurality of protrusions previously presented in claim 6. However, the Examiner cites U.S. Patent No. 3,741,292 to Aakalu et al. (hereafter “Aakalu”) as disclosing or suggesting the plurality of protrusions previously presented in claim 6.

The Poppinger reference discusses a fuel cell structure in which air is driven in along a mechanical device 20 into a fuel cell module 10. The system also includes a heat exchanger 30 which performs heat exchange on an oil which flows up from the fuel cell module 10 to the heat exchanger 30. However, the Poppinger reference does not disclose or suggest a plurality of protrusions provided on an inner surface of a stack container case such that front ends of the protrusions surround the stack. As such, the Poppinger reference does not disclose or suggest “a plurality of protrusions protruding toward said stack are provided on an inner surface of said stack container case such that front ends of said plurality of protrusions surround said stack, and said protrusions are exposed from a surface of the liquid coolant,” as recited in claim 1.

The addition of the Kususe reference does not cure the shortcomings of the Poppinger reference in disclosing or suggesting the above feature of claim 1.

The Kususe reference discusses a fuel cell stack contained in a sealed container 12 and an electrically insulative liquid 4 filling a space around the stack in the sealed container 12. The electrically insulative liquid rises in temperature and is fed to an outside heat exchanger for cooling before it is returned to the sealed container 12. However, the Kususe reference does not disclose or suggest a plurality of protrusions provided on an inner surface of a stack container case such that front ends of the protrusions surround the stack. As such, the Kususe reference does not disclose or suggest “a plurality of protrusions protruding toward said stack are provided on an inner surface of said stack container case such that front ends of said plurality of protrusions surround said stack, and said protrusions are exposed from a surface of the liquid coolant,” as recited in claim 1.

The addition of the Aakalu reference does not cure the shortcomings of the Poppinger and Kususe references in disclosing or suggesting the above feature of claim 1.

The Aakalu reference discusses a container 18 containing a number of chips 12 of an electronic module 10. The container 18 is partially filled with a low-boiling point liquid 24. Fins 28 extend from a back wall 26 into the container 18. The fins 28 extend the same distance into the container 18 substantially filling the container 18.

In the Office Action, the Examiner cites the fins 28 discussed in the Aakalu reference as being analogous to the plurality of protrusions previously presented in claim 6. However, the fins 28 discussed in the Aakalu reference are not analogous to the plurality of protrusions recited in claim 1, because the fins 28 do *not surround a stack* of any kind. More specifically, the Aakalu reference does not disclose or suggest that the fins 28 are provided on an inner surface of a stack container case such that *front ends of the fins 28 surround a stack*. As such, the Aakalu reference does not disclose or suggest “a plurality of protrusions protruding toward said stack are provided on an inner surface of said stack container case such that front ends of said plurality of protrusions surround said stack, and said protrusions are exposed from a surface of the liquid coolant,” as recited in claim 1.

For at least the reasons set forth above, Applicant respectfully submits that the Poppinger, Kususe and Aakalu references, alone or in any combination, fail to disclose or suggest each and every feature of claim 1. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. § 103(a) rejection of claim 1.

#### **B. Claims 8 and 9**

Claims 8 and 9 depend from independent claim 1 and include all of the features of claim 1. For at least the reasons set forth above, Applicant respectfully submits that the Poppinger, Kususe and Aakalu references, alone or in any combination, fail to disclose or suggest each and every feature of claims 8 and 9. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. § 103(a) rejection of claims 8 and 9.

#### **III. Rejection of Claims 2-5 under 35 U.S.C. § 103(a)**

Claims 2-5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Poppinger in view of Kususe and further in view of U.S. Patent Publication No. 2006/0088746 to Tuma et

al. (hereafter “Tuma”). Applicant respectfully traverses the 35 U.S.C. § 103(a) rejection of claims 2-5 for the reasons set forth below.

Claims 2-5 depend from independent claim 1 and include all of the features of claim 1.

For at least the reasons set forth above in connection with claim 1, Applicant respectfully submits that the Poppinger and Kususe references, alone or in any combination, fail to disclose or suggest each and every feature of claims 2-5.

The addition of the Tuma reference does not cure the shortcomings of the Poppinger and Kususe references in disclosing or suggesting the above feature of claims 2-5.

The Tuma reference discusses fluid transport layers (FTL) that facilitate gas transport to and from the anode and cathode electrode materials and conduct electrical current. The FTL may be coated or impregnated with various materials, including carbon particle coatings, hydrophilizing treatments, and hydrophobizing treatments such as coating with polytetrafluoroethylene (PTFE).

However, the Tuma reference does not disclose or suggest a plurality of protrusions provided on an inner surface of a stack container case such that front ends of the protrusions surround the stack. As such, the Tuma reference does not disclose or suggest “a plurality of protrusions protruding toward said stack are provided on an inner surface of said stack container case such that front ends of said plurality of protrusions surround said stack, and said protrusions are exposed from a surface of the liquid coolant,” as recited in claim 1, from which claims 2-5 depend.

For at least the reasons set forth above, Applicant respectfully submits that the Poppinger, Kususe and Tuma references, alone or in any combination, fail to disclose or suggest each and every feature of claims 2-5. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. § 103(a) rejection of claims 2-5.

**IV. Rejection of Claim 6 under 35 U.S.C. § 103(a)**

Claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Poppinger in view of Kususe and further in view of Aakalu.

Claim 6 is canceled. As such, the 35 U.S.C. § 103(a) rejection of claim 6 is moot.

**V. Rejection of Claim 7 under 35 U.S.C. § 103(a)**

Claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Poppinger in view of Kususe and further in view of U.S. Patent No. 4,036,291 to Kobayashi et al. (hereafter “Kobayashi”). Applicant respectfully traverses the 35 U.S.C. § 103(a) rejection of claim 7 for the reasons set forth below.

Claim 7 depends from independent claim 1 and includes all of the features of claim 1.

For at least the reasons set forth above in connection with claim 1, Applicant respectfully submits that the Poppinger and Kususe references, alone or in any combination, fail to disclose or suggest each and every feature of claim 7.

The addition of the Kobayashi reference does not cure the shortcomings of the Poppinger and Kususe references in disclosing or suggesting the above feature of claim 7.

The Kobayashi reference discusses a coolant disposed in a vapor cooling container 10 which changes from its liquid phase 12 to its vapor phase 26 due to heat generated in a semiconductor element 16. The coolant in its vapor phase 25 is upwardly moved through the connection tube 24 into the condenser 22. Within the condenser 22, the coolant in its vapor phase is condensed into its liquid phase and then drops into the reservoir portion 42. On the other hand, the liquid coolant 12 continuously boils within each of the coolant containers 10 while at the same time the coolant in its liquid phase 12 from the reservoir portion 42 is downwardly passed through the associated auxiliary tube 32 as shown at the arrow 44, until it enters the individual cooling container 10 to replenish the liquid coolant in the latter.

However, the Kobayashi reference does not disclose or suggest a plurality of protrusions provided on an inner surface of a stack container case such that front ends of the protrusions

surround the stack. As such, the Kobayashi reference does not disclose or suggest “a plurality of protrusions protruding toward said stack are provided on an inner surface of said stack container case such that front ends of said plurality of protrusions surround said stack, and said protrusions are exposed from a surface of the liquid coolant,” as recited in claim 1, from which claim 7 depends.

For at least the reasons set forth above, Applicant respectfully submits that the Poppinger, Kususe and Kobayashi references, alone or in any combination, fail to disclose or suggest each and every feature of claim 7. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. § 103(a) rejection of claim 7.

**VI. Claims 10 and 11**

Claims 10 and 11 were inadvertently omitted from the second preliminary amendment filed on September 6, 2006. Applicant is reinstating claims 10 and 11 as previously presented in the first preliminary amendment filed on June 23, 2006. No new matter has been added.

**CONCLUSION**

In view of the foregoing arguments, Applicant believes that the pending application is in condition for allowance. Should the Examiner feel that a teleconference would expedite the prosecution of this application, the Examiner is urged to contact the Applicant's attorney at (617) 227-7400.

Any fee due is authorized to be charged to our Deposit Account No. 12-0080, under Order No. TOW-153US from which the undersigned is authorized to draw. If a requisite petition does not accompany this response, the undersigned hereby petitions under 37 C.F.R. § 1.136(a) for an extension of time for as many months as are required to render this submission timely.

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